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views of invisible objects. Two photographic shadow-pictures, say of a mouse, are obtained from two different points of view and stereoscopically combined into a solid phantom-picture, showing the skeleton, etc., in actual relief. This is simply a modification, by the use of the Röntgen rays, of Mach's old and well-known method of getting solid views of concealed anatomical structures, etc. Prof. Mach has also a few remarks to make on the physical character of the X-rays. The same subject is treated at length in a second article by Prof. Hermann Schubert, who gives an account of the methods successfully employed in the Hamburg State Laboratory. Two actinograms, one of a plaice with shells in its intestines, and one of a lady's hand, showing the position of a fragment of a needle, accompany this article.

In the third article Edward Atkinson discusses 'The Philosophy of Money.' A Polish philosopher, W. Lutoslawski, of Kazan, gives a brief sketch of the philosophy of Polish individualism.

The article 'From Animal to Man,' by Prof. Joseph Le Conte, is a contribution to comparative psychology. Considering successively speech, art, thought, imagination, consciousness and will, Prof. Le Conte tries to put his finger as nearly as he can 'on the dividing line where humanity emerges out of animality.' The abstraction of *self* from the facts of consciousness, he thinks, may be regarded as the consummation of humanity. 'The Dualistic Conception of Nature' is a contribution by Prof. J. Clark Murray, tracing the fortunes of dualistic notions in the history of philosophy and religion.

Prof. Kurd Lasswitz attacks a more difficult problem in 'Nature and the Individual Mind,' a metaphysical question of profound interest to psychologists and philosophers. Prof. Lasswitz seeks to show that there is no change of mode of existence when things physical become things mental; the difference is merely a difference of combination of elements. 'Objective and subjective are distinguished solely by their existential contents.' The opposition of object and subject is originally produced in and by knowledge, and nature itself is fashioned on lines parallel with the growth of knowledge.

The doctrine of 'parallelism' which views physical and psychical phenomena as two modes of representation of the same synthesis is critically discussed, and we have also an interesting application of the psychological law of thresholds as marking the difference between nature and mind.

The last article is a discussion of the 'Nature of Pleasure and Pain,' by Dr. Paul Carus, with particular reference to the theory of Ribot. He thinks that the current views of pleasure and pain exhibit a neglect of the element of form or of the qualitative aspect of feeling. In his view the nature of a commotion is determined by its relation to the constitution and memory-structures of an organism. Pleasure is the satisfaction of a want originating in constitutional habits; pain is the felt evidence of an unsatisfied want or of any other disturbance. The author claims that this view will do away with all troublesome exceptions and inconsistencies of the old theories.

The number concludes with the usual literary correspondence and book reviews.

SOCIETIES AND ACADEMIES.

BIOLOGICAL SOCIETY OF WASHINGTON—258TH MEETING, SATURDAY, MARCH 21.

BARTON W. EVERMANN exhibited specimens of *Animals from an Artesian Well at San Marcos, Texas*. This well was sunk to obtain water for the station of the U. S. Fish Commission, and when the drill had reached a depth of 180 feet it dropped four feet, indicating the presence of a cavity. Although sunk much deeper, the well was finally closed up to a depth of 184 feet, an abundant supply of water being obtained at that level. The water flowing from the well contained a considerable number of crustaceans and a few batrachians, all blind and all new. The crustaceans comprised one species of shrimp, an isopod and a copepod. The batrachian, according to Dr. Stejneger, belonged to the Proteida, but was remarkable for the great length of its legs.

C. Hart Merriam spoke of the *Big Bears of North America*, giving the distinctive characters of the various species.

Leonhard Stejneger spoke on *The Use of*

Formalin in the Field, illustrating his remarks with examples of plants, insects, fishes and reptiles preserved in a mixture of formalin and water. The advantages claimed were cheapness, compactness, and the property of preserving specimens which could not be kept in alcohol, or could not be kept in such good condition.

Henry H. Dixon and J. Joly, of Trinity College, Dublin, summarized, by request, the results of their *Recent Researches on the Ascent of Sap in Trees*, making the deduction from an elaborate series of experiments that the movement was due to a state of tension in the sap induced by osmotic action and transpiration in the leaves. The chief necessary condition for maintaining a state of high tension (several atmospheres) is that the column of water shall not rupture, but to prevent rupture it is not necessary, as has been supposed, that the fluid shall contain no dissolved gas, but that the walls of the containing vessel be completely wet.

Under the title of *the Shade-tree Question from an Instinct Standpoint*, L. O. Howard presented a short communication upon the subject of the relative immunity from insects of different varieties of shade trees. He spoke of the extraordinary abundance of shade-tree insects in different Eastern cities during the summer of 1895, and exhibited specimens of the species which were principally abundant. He further said that in the selection of trees for shade sufficient account is not taken of their relative susceptibility to insect attack. He displayed a list drawn up a few years ago by Mr. Fernow for the Brooklyn authorities, in which the trees to be chosen were graded according to endurance, recuperative power, cleanliness, beauty and form, shade, duration of life period, rapidity of growth, and persistence; and in comparison with this list he rated the same trees according to their susceptibility to insect attack or their immunity from insect attack. The latter rating showed a somewhat different relative arrangement from the total rating derived from other qualities, and the speaker, while admitting the value of the total relative rating from so many important characteristics, expressed himself as of the opinion that in one or two cases, notably with

the box elder, extraordinary susceptibility to insect attack renders them practically useless for shade-tree purposes, in spite of their many good qualities from other standpoints.

F. E. L. Beal read a paper on *the Food of the Cowbird, Molothrus ater*, giving the results of an examination of the contents of 366 stomachs of this species, collected in 20 States and the District of Columbia, and representing every month from March to December inclusive. The food was found to consist of about 28 per cent. of animal matter and 72 per cent. of vegetable. The animal food was composed almost exclusively of harmful insects and spiders. The vegetable food consists of 20 per cent. of grain (corn and oats), 51 per cent. of weed seeds and traces of fruit and a few other miscellaneous articles. As at least half of the grain eaten must have been waste, the conclusion is reached that in its food habits the cowbird does far more good than harm.

F. A. LUCAS,
Secretary.

CHEMICAL SOCIETY OF WASHINGTON.

THE eighty-sixth regular meeting was held February 13, 1896, at the rooms of the 'Downtown Club,' and after the transaction of necessary business, was devoted to a lunch and social purposes, inaugurating the newly elected president, Dr. E. A. de Schweinitz. The following members also were elected: Messrs. Clinton P. Townsend, S. S. Voorhees and Dr. F. K. Cameron.

A special meeting was held February 21st to hear the Presidential address of the retiring President, Prof. Chas. E. Munroe, the subject being 'The Development of Smokeless Powder.' He first sought to show that the necessity for a high power, smokeless propellant had been created by the mechanical perfection to which ordnance had attained, and the precision of the weapons and instruments by which they were directed; that the possible production of such propellants was dependent upon the discovery of gun cotton, nitro-glycerine and certain nitro-substitution compounds and the improvements in their manufacture; that the possibility of producing uniform and reliable propellants was dependent on the invention of pressure gauges and velocimeters; and that the possibility of

their economical production was dependent on the invention of mechanical mixers applied in other arts. In a historical resumé the recency of most of the inventions and discoveries was pointed out, and it was shown how large a proportion was due to American scientific men. The many smokeless powders manufactured or proposed were enumerated and classified into mixtures of different cellulose nitrates with oxidizing agents; mixtures of soluble or insoluble cellulose nitrates with nitro-glycerine; mixtures of cellulose nitrates with nitro-substitution compounds; and pure cellulose nitrate powders, and the methods of manufacture were briefly described.

The author's own experience in inventing a smokeless powder was then given. Recognizing at the outset the necessity for the closest approximation to absolute chemical and physical uniformity in a high-powered powder, and being familiar with the difficulty of securing such constancy in a physical mixture, he set about producing a powder from a carefully purified cellulose nitrate of the highest degree of nitration. This was the first and only attempt, so far as the lecturer was aware, to produce a powder which consisted of a single substance in its pure state.

The powder was manufactured at the Torpedo Station and proved at Indian Head by ordnance officers of the Navy. Secretary Tracy in his report (1892) says: "It became apparent to the Department, early in this administration, that unless it was content to fall behind the standard of military and naval progress abroad in respect to powder, it must take some steps to develop and to provide for the manufacture, in this country, of the new smokeless powder, from which extraordinary results had been obtained in Europe. With this object negotiations were at first attempted looking to the acquisition of the secret of its composition and manufacture. Finding itself unable to accomplish this, the Department turned its attention to the development of a similar product from independent investigation. The history of these investigations and of the successful work performed in this direction at the Torpedo Station has been recited in previous reports. It is a gratifying fact to be able to show that what we could not

obtain through the assistance of others we succeeded in accomplishing ourselves, and that the results are considerably in advance of those hitherto obtained in foreign countries."

The conditions that smokeless powder should fulfill, and the tests prescribed by the lecturer were then set forth, and in closing he pointed out that the powder was now developed to a higher degree than the gun and that changes in the latter to render it more efficient were being considered by ordinance experts.

A. C. PEALE,
Secretary.

GEOLOGICAL SOCIETY OF WASHINGTON,
MARCH 25, 1896.

MR. WHITMAN CROSS described the diorite of Ophir Loop, Colorado, and the remarkable inclusions contained in it. The diorite at this locality is a lateral arm of a stock which cuts up through Cretaceous sedimentary rocks and a bedded volcanic series of Tertiary andesites. The lateral offshoot from this stock is intruded as an irregular sheet between the Dakota Cretaceous and the upper Jurassic, reaching a thickness of 1,000 feet. In its lower portion it is locally very full of included rock fragments. These inclusions were described, and specimens were exhibited. They are interpreted as genetically connected with each other and with the diorite magma, which brought them to their present position.

The diorite is a variable rock, with augite and hornblende. The inclusions vary from feldspathic rocks, poor in dark silicates, to black amphibolites nearly free from feldspar. They are developed in granular and banded forms, and exhibit all manner of gradations in structure as well as in composition.

The study of these rocks led to the stated conclusions that quite local differentiation has gone on in the depths from which both diorite magma and inclusions came, and further, that a shearing movement of the differentiated magma, followed by consolidation, produced rocks greatly resembling many gneisses, amphibolites and schists, and especially those of the Archean complex. It was suggested that some gneisses and associated rocks of unexplained or assumed metamorphic origin may be primarily banded

igneous rocks, which should be considered with their massive equivalents rather than with secondary schists of similar constitution.

Mr. H. W. Turner described the *Archean Gneiss in the Sierra Nevada*. The western part of Nevada was thought by the geologists of the 40th Parallel Survey to be an Archean area which, during Paleozoic time was a land mass, since there are no known Paleozoic sediments resting on it. It was supposed that Archean rocks existed in the Sierra Nevada, although the Jurassic age of the hornblendic granites of that range, as stated by Whitney, was accepted by the 40th Parallel Survey geologists.

An area of such rocks is believed to exist in the central part of the range, and is well exposed in the canyon of the north fork of the Mokelumne River and its branches. The rocks are chiefly gneisses with which are associated a granite which differs from the Jurassic granite of the range in containing much potash feldspar, and no hornblende, or very little. This granite is indistinguishable from some of the Archean granite of the Fortieth Parallel survey collections. The gneisses vary much in composition, some of them being made up chiefly of plagioclase, monoclinic pyroxene and biotite; another type is composed of plagioclase, hornblende and biotite; others carry quartz, and correspond nearly to a quartz-mica-diorite in composition. Titanite, zircon, apatite and pyrrhotite are among the accessory minerals. Some of the titanites exhibit a pleoëchrisms, like that found by Lacroix to be characteristic of that mineral in pyroxene-gneisses. Certain light colored bands containing garnet, quartz and a mineral resembling wollastonite, may represent original limestone lenses, or may be regarded as vein deposits. One stratum, supposed to be a quartzite in the field, contains much pyroxene between interlocking quartz grains, and also numerous zircons. By far the greater part of the area is made up of the plagioclase-hornblende-biotite gneiss. The contact of the series with the large mass of hornblendic granite lying to the east is sharp. Apophyses of the hornblendic (Jurassic?) granite extend into the gneiss and older granite as dikes, and there are clear cut inclusions of the gneiss in the late granite. All of the rocks

composing this Archean complex are thoroughly crystalline, and there is at present no positive evidence that any portion of the mass represents original sediments. The area has a maximum diameter of about nine miles. On the west it is in contact with the great area of Paleozoic sediments of the Gold Belt of the Sierra Nevada. Its relation to this Paleozoic series has not been made out.

NATIONAL GEOGRAPHIC SOCIETY.

AT the regular technical meeting of this Society held in Washington, D. C., March 20, Mr. Gilbert Thompson explained and advocated the use of geodetic control lines in geographic work as supplementary to primary triangulation, when such lines are measured with care and latitude and longitude determinations made, etc. Following him, Mr. N. H. Darton read a paper on the 'Physiographic Development of the District of Columbia Region.' He outlined the geologic history of the river from early Cretaceous time, mainly in its bearing on the cycles of development. The present configuration is the product of sculpturing and deposition in Pleistocene times, but buried beneath the various deposits there is a succession of older land surfaces. The earliest recognizable surface is the floor of crystalline rock on which the Potomac formation was deposited. This is exposed in many points in the vicinity of Washington and it is seen to be a relatively smooth peneplain surface, which originally sloped very gently to the east and southeast. Other similar plane surfaces were eroded in the uplifts separating the several later Cretaceous, Eocene, and Neocene formations. These were widely extended base levelings, which were part of the general Tertiary planing of the Piedmont region. The present topography began with the uplift of the Lafayette, which amounted to about 120 feet. As the land rose the Potomac river was born, with its seaward course deflected by shoals on the Lafayette surface. The minor drainage was developed with approximately its present outlines, cut more or less deeply. Then with slight submergence with deposition, in which the early Columbia formation was spread over the floor of the wide river trough, and up the lateral valleys.

Then followed emergence, in which the early Columbia deposits were trenched and a wide terraced inner valley cut by the river. The widening did not progress as far as in the pre-Columbia period and wide areas of earlier Columbia terrace remained, at altitudes averaging 200 feet. Next came submergence, in which the later Columbia was laid down, and then followed a widespread moderate uplift in which this formation was trenched to a few yards before the present tide level. The next epoch is the present, in which the land is sinking; tide water extends far inland and it is encroaching gradually. The paper was illustrated by many slides from photographs of maps, diagrams, topographical feature and formation.

W. F. MORSELL.

U. S. GEOLOGICAL SURVEY, WASHINGTON, D. C.

THE ACADEMY OF SCIENCE OF ST. LOUIS.

At the meeting of the Academy of Science of St. Louis, April 6th, forty persons present, Prof. C. R. Sanger spoke on the commercial synthesis of acetylene, illustrating the flame procurable from this gas when burned with a proper proportion of air.

Prof. Sanger also presented the results of a preliminary biological and chemical examination into the ice supply of St. Louis, and exhibited a device for melting ice in such examinations without danger of contamination from atmospheric ammonia, etc.

The Secretary presented for publication, by title, a paper by Mr. Charles Robertson, entitled 'Flowers and Insects.'

Mr. William H. Roever presented a paper on the geometry of the lines of force from an electrified body, in which it was shown that (a) the curve representing a line of force proceeding from a system consisting of two parallel electrified lines, is the locus of the intersection of two straight lines, rotating in the same plane about these two parallel lines as axes with uniform but different angular velocities; (b) the curve representing a line of force proceeding from a system consisting of two electrified points is the locus of the intersection of two straight lines, rotating, in the same plane about parallel axes passing through those

points in such a manner that the versines of their angles of inclination to the plane of the axes change at uniform but different rates.

WILLIAM TRELEASE,

Recording Secretary.

BOSTON SOCIETY OF NATURAL HISTORY.

By the courtesy of the Massachusetts Institute of Technology the Society held its general meeting of March 18th in the physical lecture room of the Institute. Four hundred persons present. Prof. Charles R. Cross spoke of the X-rays, discussing the subject from an historical standpoint. He illustrated the phenomena connected with the disruptive discharges of electricity across an air space, across a space wherein there is little air, and in a tube in which a nearly perfect vacuum is maintained. The experiments and theories of Crookes, Herz and Lenard were reviewed; the distinctive characters of the X-rays, and the experiments of Röntgen described. The fluorescence of certain substances, such as platino-cyanide of barium, a marked peculiarity of the X-rays, was shown by illuminating a Crookes tube placed in a light-tight box; the rays passing through sheets of vulcanite and aluminum caused a prepared slip of platino-cyanide of barium to glow with a soft phosphorescent light. The work of various experimenters upon photographic plates and upon electrified substances was described in detail. Experiments to show the effect of the X-rays upon Bacteria, while not final, point to the conclusion that the Bacteria are not killed.

SAMUEL HENSHAW,

Secretary.

ACADEMY OF NATURAL SCIENCES OF PHILADELPHIA.

March 31.—A paper under the following title was presented for publication: 'Dr. Collet on the morphology of the cranium and the auricular openings in the North European species of the family Strigidæ; to which is added some recent opinions upon the systematic position of the Owls,' by R. W. Shufeldt.

Prof. Henry A. Pilsbry called attention to a fine collection of barnacles obtained from the bottom of a vessel recently returned from a

voyage to Hong Kong from San Francisco and back by way of Java and India. *Balanus tintinabulum* was the commonest of the species represented; the varieties *zebra* and *spinosus*, although growing under identical conditions, retained their individuality perfectly.

The question of the constancy of varietal characters was debated by Messrs. Sharp, Pilsbry and Heilprin.

Mr. Pilsbry also described a specimen of *Pugnus parvus*, a Ringiculate mollusk. The species is involute, a unique character, none of the fossil forms of the family possessing it. He also described a Central American Melanian under the name *Pachycheilus Dalli*. It is distinguished by a remarkable double sinuation of the outer lip which has a deep and wide Pleurotonoid sinus above and a rounded, projecting lobe in the middle, below which it is again retracted.

On the nomination of the Entomological Section, Dr. Henry Skinner was elected Professor in the Department of Insecta.

In response to an invitation from the Committee having charge of the celebration of the fiftieth year of Lord Kelvin's tenure of office as Professor of Natural Philosophy in the University of Glasgow, General Isaac Jones Wistar was appointed to represent the Academy on the occasion.

Entomological Section, Dr. Henry Skinner, Recorder, March 25.—Dr. Geo. H. Horn made a communication regarding the synonymy of the Elateridæ. He specially described the prosternum of *Ludius*. A Lower California form had the prosternum of different shape from that of other members of the genus, the mesosternum being more protuberant. It will probably be referred to *Probothrium*.

Mr. Chas. S. Welles exhibited specimens of the larva of *Harrisimemna trisignata*. When full grown they bore into wood preparatory to changing into crysalids.

A paper was read entitled 'The breeding habits of *Periplaneta orientalis*,' by C. Few Seiss. Three females deposited twenty-five egg cases. Each of these contained sixteen eggs, so that a new generation of four hundred cockroaches was represented by the deposit. The first of these egg cases were dropped May 5 and 14,

1895, and were hatched November 9th. In most cases the deposits were dropped with no attempt at concealment, although in a few instances they were placed in little trenches made by the insect and then covered up. The development of the capsules was described. The young probably receive no maternal care or protection.

Mr. Lancaster Thomas exhibited an improved form of insect net frame made of a continuous piece of rounded aluminum wire.

Mr. Westcott suggested linoleum as a substitute for cork in the arrangement of insects. Dr. Henry Skinner called attention to a fungus, *Polyporus betulinus*, which might be used for the same purpose with advantage.

Mr. Wm. J. Fox stated that about ninety species of Hymenoptera, six of which were perhaps new to science, were included in the collection of insects brought by Dr. A. Donaldson Smith from western Somali Land, Africa.

EDWARD J. NOLAN,
Recording Secretary.

NEW BOOKS.

Text-book of Comparative Anatomy, Part II.

ARNOLD LANG; translated by Henry M. Bernard and Matilda Bernard. London and New York, Macmillan & Co. 1896. Pp. xvi+618. \$5.50.

Memoirs of Frederick A. P. Barnard. JOHN FULTON. New York and London, Columbia University Press, Macmillan & Co. 1896. Pp. xii+485. \$4.00.

Water Supply. WILLIAM P. MASON. New York, John Wiley & Sons. London, Chapman & Hall, Ltd. 1896. Pp. iv+504.

A Dictionary of the Names of Minerals. ALBERT HUNTINGTON CHESTER. New York, John Wiley & Sons. London, Chapman & Hall, Ltd. 1896. Pp. xv+320.

Geschichte der Explosivstoffe. S. J. ROMOCKI. Volumes 1 and 2. Berlin, Robert Oppenheimer. 1895, 1896. Pp. vi+394, xiv+324. M 12.

Twenty-first Annual Report of the Secretary of the State Board of Health of Michigan. Lansing, Robert Smith & Co. 1895. Pp. cxxiv+444.